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Science -- Promise or Threat to the Future?

A radio discussion over WNAC and the Mutual Broadcasting System in cooperation with the Lowell Institute Cooperative Broadcasting Council

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Science -- Promise or Threat to the Future?

MR. BUCHANAN: Is modern science a promise or a threat to the future?

MR. KILLIAN: Science, it seems to me, holds the same promise and threat to the future as does our industrial system. Both are essential to peace and prosperity; both help in making peace and war possible.

MR. KLOPSTEG: Not science, but the manner in which the so-called human race uses science, is on trial. Whether the exploitation of science by mankind becomes promise or threat, blessing or curse, is a question to which physical science has no answer.

MR. ZACHARIAS: I think that man is his own worst enemy, but science is often the unwitting accomplice in the villainy.

* * *

MR. BUCHANAN: This week the attention of this nation and of the world is focused on the Massachusetts Institute of Technology here in Cambridge, Massachusetts. Thinking men from everywhere are gathering here for the school's convocation on scientific progress. Today the Reviewing Stand salutes M.I.T. and its contribution to science as we take a searching look at the part which science may play in our future.

Industry and Science

Mr. Killian, you seem to regard industry and science in a similar light. You mean, then, that science must necessarily become a part of industry?

MR. KILLIAN: Not at all. I think that industry contributes just as much to peace or to war, to good or to evil, as science does. They are both essential enterprises in our present-day method of living.

MR. BUCHANAN: Mr. Klopsteg, you say that science is aware that it may be either a blessing or a curse. Can't scientists determine the results which science may bring and thus direct their uses?

MR. KLOPSTEG: Mr. Buchanan, I think, first of all, we must be clear as to what we mean by science. We distinguish generally between basic science and applied science. By basic science we mean the search for truth in the laboratory, and by applied science we mean the application of this basic and fundamental body of knowledge to human needs and human welfare, such as in medicine, which is applied science that seeks to prevent and cure disease. Likewise, engineering seeks to find the best ways of producing goods and services; agriculture seeks to increase production of food. Then we have another very prominent application of science, the making of war.

Basic and Applied Science

MR. KILLIAN: Mr. Klopsteg, I would comment on your definition of science in this way: It seems to me the fundamental aspects of basic science or what some people call pure science—I think that is a bad term—are the motivation involved and the method. It seems to me that pure science is involved in trying to discover in a disinterested way the basic facts of life, while applied science is trying to apply those facts to some specific objective.

MR. BUCHANAN: I believe that is what you may have had in mind, Mr. Zacharias, when you mentioned villainy and the unwitting part that science may play?

MR. ZACHARIAS: I'd better amplify that. I think that science is an incentive activity in itself and that it need not have a profound effect for good or evil. Like painting or any other

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serious intellectual pursuit, it exists for its own sake in the lives of persons who have a taste for it, but by the time discoveries are made by scientists, the theories are necessarily public knowledge and these discoveries can be converted into gadgets, large or small, some for good and some for evil.

But this conversion is not in the hands of the scientists at all. It is in the hands of the people who want to see the conversion made and in the hands of the engineers and the industrialists who make the conversion.

MR. KILLIAN: I would like to make an additional comment about the objectives of science since we are trying to define as clearly as we can what it actually is. It seems to me that science has made a contribution to human thinking and human idealism that we should not overlook. It is a great deal more than gadgets, as Mr. Zacharias has said. It is a great deal more than the actual applications that we make to the practical necessities of life. Science has increased the dignity of the human mind. It has given us a creative attitude toward life. That is one of its most important fundamental contributions.

Science Seeks Truth

MR. ZACHARIAS: The object of natural science is to seek a simple and elegant description in nature, and whatever we say that we really know can then be compared ultimately in all its details with nature. At the present, of course, we are content with trying to understand only the simplest phenomena. But fundamentally our training is to seek the truth, then whatever we say that we really know can be compared with nature. If nature says we are wrong we will gladly try to improve and rectify our theories.

The moral value associated with this willingness to admit that one is wrong, and to have the courage and the patience to seek what is right is more important than all the fast airplanes, the specific drugs, the radios, and the television sets.

MR. BUCHANAN: When you speak of the moral value, do you mean that what we find in nature is the right thing?

MR. ZACHARIAS: I didn't say that what we find in nature is necessarily the right thing. What we seek is to compare our theories with nature, and if our theories are indeed the right ones, nature will say they are right. But the very process of going after these comparisons between theory and experiment is itself a mechanism that operates to teach us how to do things in a more forthright way.

MR. KILLIAN: I think you ask a very good question, Mr. Buchanan, which I don't believe Mr. Zacharias has completely answered. Does the scientist ever think in terms of the moral values of the science he produces? Does he consider, for example, when he decides to undertake a certain experiment, what effect that experiment may have in terms of good and evil to the human race?

I would venture the suggestion that up until the war such consideration had not been an important factor in the thinking of scientists. It has been understood for a long time that when a scientist goes into his laboratory he shuts the door on the world and to all other considerations except the objective search for truth which goes on under controlled conditions in that laboratory.

Atom Bomb Awakened Scientists

MR. KLOPSTEG: I think the results of scientific development during the war emphasize what Mr. Killian has just said. The physical scientists who were working on atomic energy up to that time probably had concerned themselves very little about the social consequences of the work they were doing, but, when the first bomb exploded, it brought such consequences most forcibly to their consciousness. Since that time a great many physical scientists have concerned themselves with the moral values of what they are doing.

MR. KILLIAN: In connection with what you say, I have been impressed with

the large number of scientists who are concerned with promoting world government. It seems to me that, since the war, scientists have become world citizens because they recognize the absolute necessity, in the face of the power of atomic energy, that we have some kind of world government.

MR. ZACHARIAS: Certainly every scientist wants to pursue science in his own way. He likes the subject; that is what he is interested in and that is what he does. On the other hand, there has to be a world in which this process can go on, and, in order for there to be a world, we must not have the wars that might be more horrible because of the discoveries that stem from science.

MR. KLOPSTEG: I should like to come back to an example of what might be a widely-held popular misconception. During this past week Frank Lloyd Wright was quoted as saying, "As science has mowed us down and we are ready to be raked over the brink, what would save us but a sense of honor?"

I think we must take issue with the assertion that "science has mowed us down." If we have in fact been mowed down—which I question—it may have been through the misuse of science and technology. But I would rather suspect the cause is, as Mr. Zacharias has intimated, man's inhumanity to man, or just plain cussedness.

No Modification of Nature?

MR. BUCHANAN: Do you say that the scientist tries to understand nature, not to modify it, Mr. Zacharias?

MR. ZACHARIAS: I think one always has to look at this in two ways. Basic scientists—whether they be medical men, physicists, or anything else—always have to find how nature operates. They do this in a relatively dispassionate way.

Then, there is the other side, which is the application. For instance, once a physicist has made a discovery, then this discovery can possibly be converted into some kind of usable thing. For instance, a medical man might understand human biology better and better, but the process of diagnosis and therapy is something in addition to the understanding. The social scientist correspondingly will have to formulate some kind of dispassionate theory of social behavior, and then he may try to suggest methods for modifying the situation.

MR. KILLIAN: I think I detect in what Mr. Zacharias has said the feeling that the scientist, as he works in his laboratory, doesn't have any motivation directly related to benefiting people and that in no sense can science make a direct contribution with the welfare of human beings as a motivating factor. I doubt that very much. I suspect one of the most powerful factors in the scientific mind, perhaps unconsciously, is that a man is making an important contribution, not only to the practical comfort of people, but to the development of people's minds and the development of their understanding of the universe.

MR. KLOPSTEG: Isn't the basic justification for scientific research the benefit that can come from it?

Of Hottentots and Science

MR. ZACHARIAS: I don't agree with that at all. I see no reason why one should believe that advances in human comfort are indeed advances in human welfare. It seems to me that the simile of the *happy Hottentot* is exactly the right one.

MR. KILLIAN: I would like to ask Mr. Zacharias if he would like to be a happy Hottentot, having all kinds of superstitions which control his actions, believing that eclipses have something to do with evil spirits, believing all the curious and extraordinary things that man believed many thousands of years ago. I wonder whether he would enjoy that kind of existence.

What he is saying, in effect, is that the happy Hottentot is as well off as he is at the present time, that his understanding, his concepts, his idealism and his achievements are probably as great as those of Mr. Zacharias.

MR. ZACHARIAS: If I were born one, I would be happy being a happy Hottentot.

MR. KILLIAN: Because you didn't know any better probably!

MR. ZACHARIAS: Certainly, because I didn't know any better. But naturally one is going to move forward some way or other, and the rate of moving forward is certainly no criterion as to whether you are better or worse off.

MR. BUCHANAN: You mean that what you don't know won't hurt you?

MR. ZACHARIAS: That's right.

MR. KILLIAN: I am still enough of an optimist to believe there has been great progress in the human race, human understanding, human idealism, and dignity.

MR. ZACHARIAS: I think we are going to need a lot more progress in social and political matters before we are well off.

MR. BUCHANAN: Let me return to the social science field. How do you, Mr. Klopsteg, differentiate between the social scientist and the physical scientist?

Social and Physical Science

MR. KLOPSTEG: The social scientist is dealing with a laboratory which is society; it is the world. He can't wall off any large section of his research material. He must take it as he finds it, and it is constantly in a state of flux. So he can't stop it at a particular point and take static samples. He must use statistical methods of studying the many variables and their interrelationships. The physical scientist can get into his laboratory and close the door behind him; he can and does deal with inanimate things objectively. He can hold certain of the variables fixed, can study the effects on the other variables, and can arrive at conclusions unharried by any human pressure on him. The social scientist, on the other hand, is certainly part of the picture which he himself is studying.

MR. BUCHANAN: Mr. Klopsteg, when you say that the scientist can close the door behind him, do you mean that he doesn't particularly care what goes on in the outside world?

MR. KLOPSTEG: That isn't necessarily implied. He has everything he needs in his laboratory and he can close the door if he wishes.

MR. ZACHARIAS: He has everything he needs in the laboratory, perhaps, but remember that a scientist is a human being, too, and there are 24 hours in the day. He might be able to spend 16 of those 24 hours in the laboratory, but during at least part of his waking hours he has to be sure that the laboratory has a world to be in. He is going to work very hard and think very hard about that world.

Emphasize Social Science?

MR. KILLIAN: I would like to come back to Mr. Klopsteg's comment on social science. The fact that it is so enormously more difficult in its techniques doesn't mean that it ought to have any less stress. In fact, I think the greatest need of our modern period is a more complete development of social science. That, it seems to me, is a matter of giving more attention to social problems, perhaps giving them more support, but basically attracting more imaginative, creative minds to those fields. Then, we can begin doing the kind of creative thinking for which physical science has set the precedent.

MR. KLOPSTEG: Mr. Killian, would you say the social scientist is the person who must take the lead in finding out what to do with science?

MR. KILLIAN: I think we need all kinds of people to take leadership. The social scientist perhaps has to develop some of the techniques and some of the understanding that we need for better organization of our social structure, but politicians, social scientists, and physical scientists themselves must contribute to this problem.

MR. ZACHARIAS: I don't see any reason why social science should be any differ-

ent from the science with which I am most familiar, and physical science advances at the hands of giants in the field. I am sure right now we need a new Albert Einstein to point the direction in which nuclear physics ought to go. And I am morally certain that social science needs some tremendous giant to point the way to related fields.

MR. BUCHANAN: When you deal with things of such great magnitude, does science have no responsibility for what it does?

Scientists Are Also Citizens

MR. KLOPSTEG: Not science itself; science is a body of knowledge. I think, however, that the scientists must, as good citizens, become conscious of the results of their work and must take a hand in trying to direct it properly.

MR. KILLIAN: An interesting development in recent years is that scientists are beginning to take a point of view of the medical men: that perhaps they can set up a code that might govern some of their actions. That is particularly true in the field of applied science. The doctors have their Hippocratic oath; they have certain standards that are related to moral responsibilities for their actions. Perhaps the physical scientists can accomplish something of that sort.

MR. ZACHARIAS: Mr. Killian, you wouldn't go so far as to believe that in time of emergency the scientist should do anything but jump to the aid of his country?

MR. KILLIAN: No, I am not talking about an emergency condition, but a peaceful condition when the really basic advances in science are made. At that time we need a sense of moral responsibility about the direction of science.

MR. ZACHARIAS: Isn't it true that those basic peacetime conditions are very difficult to recognize?

MR. KILLIAN: Yes, I think they probably are. That is the basic difficulty, but some of our scientists who are tackling this problem are concluding that they will not make any contribution to those fields of science which they feel may lead directly to war. I grant that there is practically no field of human endeavor that can't be applied to war. But even an effort to make a moral determination there is important.

MR. ZACHARIAS: I think you can give lip service to this thing, but I don't believe you can really do it, because you certainly don't know what kind of application is going to be made to a scientific discovery.

MR. BUCHANAN: What application of the scientific work now going on could be made toward peace?

MR. ZACHARIAS: Something happened towards the end of World War II, the detonation of several tremendous bombs. Those bombs, I think, should have frightened the people of the world into the feeling that there has to be some kind of future peace. And this, you might say, is a contribution by threat; nonetheless it is an important contribution.

Ways Science Can Help Peace

MR. KLOPSTEG: I don't think we have made very much progress yet in finding out how science is to be turned to promise rather than threat.

One of the essential things, it seems to me, is that, as we stand now, government is necessary to prevent the selfish inclinations of man from exploiting his fellow man. As populations advance more and more restrictive regulations and as more curbs on individual freedom are brought to bear, I wonder if the phrase, *Peace on earth to men of good will* is just a pretty phrase or if it can be given meaning? Is that one of the ways of achievement?

MR. KILLIAN: May I suggest, Mr. Klopsteg, some practical ways in which science, particularly applied science, can contribute to peace on earth? I think it can help remove some of the basic problems that now

are creating friction and dividing people—for instance, the barriers between people who have inadequate resources and people who have, by the standards of their foreign friends, more than adequate resources. It seems to me that science can make a major contribution to world peace by creating a higher standard of living throughout the world. That is its one basic opportunity at the present time.

MR. KLOPSTEG: You are speaking of barriers, Mr. Killian. It seems to me that one of the greatest barriers to achieving world peace is the lack of understanding among peoples; that points very clearly to the need for free communication among peoples.

MR. KILLIAN: That certainly is another practical way that science can help—by freeing our channels of communication. But I would point out the danger there. If we misuse our channels of communication as we see them misused today—that is, by employing them for propaganda purposes and to spread untruths and misinformation—the channels of communication can do more harm to peace than they can possibly do good.

Improve Agriculture, Industry

MR. ZACHARIAS: I think human welfare is most significantly to be advanced in the matter of peaceful international relations. The greatest obstacle to the advancement of a federal government of free nations is the disparity in the distribution of the world's wealth, or in the availability of this wealth. We have, with the advances that come from scientific development, the possibility of improving the conditions of the under-developed areas of the world, and thereby of benefiting the people who live in the under-developed areas.

I now regard agriculture as a rather primitive science. However, improvements in agriculture and in the methods of production of raw materials, including food, building materials, and the like, can improve the lot of the "have-nots" to the point where we will honestly be willing to join with them in a federated world. It is hard to criticize the people of this country just because they are not willing to share completely with the two billion underprivileged people of the world.

MR. KLOPSTEG: I think what you say, Mr. Zacharias, is the same as saying that if all mankind were adequately clothed, housed and fed, there would be no inducement to war. I question whether that is within the realm of possibility. Can the production of food and clothing and shelter be kept abreast of the growing need as the population grows?

MR. ZACHARIAS: It is not just a matter of need. Certainly if the living standard is reduced to a very low level, if people are hungry, they are going to be far more belligerent than if they just don't have an additional motor car.

Science—A Promise

MR. KILLIAN: May I suggest a further answer. Dr. Bush in his famous book, *Science—The Endless Frontier*, suggested that the resources which science makes available are almost unlimited. It seems to me that is almost a basic fact. One of the ways in which we can provide a higher and higher standard of living is by the creative aspects of science which help us to replace exhausted raw materials and to produce new materials.

MR. BUCHANAN: What about the promise or threat implications in our discussion? Mr. Killian, do you think that science is working more toward promise, or, because we hear so much of the atomic bomb, do you think more toward a threat to world peace?

MR. KILLIAN: I certainly think that science, if we can adjust its uses through government, through politics and through a better human understanding of international problems, is a much greater promise than it possibly is a threat.

I am interested, however, in some of the current discussion of a book by the English physicist, Professor Blackett. He won the Nobel prize, you remember, and he has written a book called *Fear, War, and the Bomb*, which seems to me to express some very dangerous doctrines at the present time—dangerous because he tends to minimize the destructiveness and the danger of the atomic bomb. I think this view is exceedingly dangerous, because our people must understand that atomic energy misused, used for war purposes, is the most terrible weapon that has ever been conceived.

MR. ZACHARIAS: It seems to me that one of the things Professor Blackett did was to set up a straw man that nobody else but himself has set up. What he tried to prove in his book was that the atomic bomb was not the only and the ultimate weapon. What he did not emphasize was the fact that most people are simply afraid of the destructive power, and the destructive power is certainly there.

Importance of Atomic Warfare

MR. KILLIAN: There is a very interesting review of Professor Blackett's book by Professor Ridenour of the University of Illinois in which he points out the underlying fallacies of Mr. Blackett's argument. Mr. Blackett takes the point of view that the strategic bombing during the war was not really effective, and consequently the atomic bomb of a future war may not be effective. I think anyone who has visited the bombed cities of Europe and who knows what happened in the latter stages of the war when strategic bombing really got under way will not agree in any sense with Professor Blackett's contention. Professor Blackett also contends that the United States used the atomic bomb for quite ulterior purposes when we dropped it on Japan, that we were attempting at that time to keep Russia from moving into the Far East and that we wanted to force Russia into a position of moral disadvantage. Those seem to me to be purely irrelevant considerations.

MR. KLOPSTEG: If we may leave the atomic bomb for a moment, there is a question over which I have puzzled a good deal. In our scientific research and development I see increasing pressure to get answers *now*. More people are urged to get into science and to work hard. The questions that occur to one in that connection are: What is the hurry? Isn't there plenty of time? Why can't we relax? Wouldn't the quality of work we are doing be better if we took more time? Have we in development of gadgets reached "the point of no return?" Must we keep running to stay where we are?

Speed Up Research

MR. KILLIAN: I don't believe we have reached that point at all. It seems to me the dynamic quality of research and investigation which you mentioned, Mr. Klopsteg, is a natural pace. It grows out of the natural interest in the subject, and you can't control that sort of thing.

I also think that it is important to remember that we face a vital problem in the world today in replacing exhausted natural resources. We have great problems ahead, great duties ahead, and science and technology must help us do those things. Consequently, we must not slow up.

MR. ZACHARIAS: Besides that, science is fun, and we are going to keep on with it at whatever pace we choose.

MR. BUCHANAN: Science to most of us, I think, is a strange and formidable confusion. But if we have difficulty in understanding, I think we *must* understand if this world is to go on.

And we agree, I am sure, that science is working toward the benefit of mankind, but that it needs the help of more than the scientist if it is to accomplish that end.

Many of us may not understand the problem—that is certainly true—but we can understand that it is up to us to help form the answer to our question, "Is science a promise or a threat to the future?"

Suggested Readings

Compiled by Laura R. Joost, Assistant, Reference Department, Deering Library, Northwestern University

BLACKETT, P.M.S. *Fear, War and the Bomb; Military and Political Consequences of Atomic Energy.* New York, Whittlesey House, 1949.

The atom's power in war and peace, with the discussion sympathetic to the Russian point of view of no necessity for control from the outside.

BRADLEY, DAVID *No Place to Hide.* Boston, Little, Brown & Co., 1948.

An account of the experiments conducted at Bikini in which the author stresses the aftermath of the explosion and the impossibility of escaping the consequences of the atomic bomb.

BUSH, VANNEVAR *Science—The Endless Frontier.* A Report to the President. Washington, Government Printing Office, 1945.

Recommends that an agency be created to promote scientific progress and renew the reservoir of scientific talent.

COHEN, I. BERNARD *Science, Servant of Man.* Boston, Little, Brown, 1948.

Shows how scientific discoveries are made and how their application affects the phases of modern life.

DAVIS, HARRY MEYER *Energy Unlimited; The Electron and Atom in Everyday Life.* New York, Rinehart, 1948.

A simplified explanation of the working of the electron and the atom in everyday life.

ROYAL INSTITUTE OF INTERNATIONAL AFFAIRS *Atomic Energy; Its International Implications.* London, The Institute, Chatham House, 1948.

Discussions centering around the scientific background and control of atomic energy.

SMYTH, HENRY DEWOLF *Atomic Energy for Military Purposes.* Princeton, N.J., Princeton University Press, 1945.

The official report on the development of the atomic bomb under the auspices of the United States government, 1940-45.

Fortune p. 53-61+, Jan. '49. "The Atom and the Businessman: The Atom Grows Bigger and Bigger Every Day; Can Private Industry Invest in its Peacetime Aspects, and Are There Profits in It?"

A lengthy discussion which leaves the impression that profits from industries making use of atomic energy are apt to be kept so small because of the necessary control by the AEC that big business will not be seriously interested in its development and use.

Nineteenth Century 145:39-43, Jan. '49. "Atomic Energy and the Problems of Europe." Address given at Westminster School, Nov. 20, 1948. BERTRAND RUSSELL.

Earl Russell substantiates his thesis that the atom bomb makes imperative the necessity for thinking in terms of mankind and peace rather than in terms of nations.

Public Opinion Quarterly 12:236-242, Summer '48. "The Human Sciences and World Peace." HADLEY CANTRIL.

A report on the UNESCO project: "Tensions Affecting International Understanding."

Saturday Evening Post 221:23+, Nov. 6, '48. "How Soon Will Russia Have the A-Bomb?" W. L. LAURENCE.

Supporting the theory that it will be some time yet before Russia has the atom bomb, this article contends that the U.S., combined with other nations, should present Russia with an ultimatum: consent to international control of atomic development or be prepared to have Russian atomic plants destroyed.

Science 109:131-7, Feb. 11, '49. "Science and Maintenance of Peace." B. J. BOK.

Answers to two questions put to a representative group of scientists: (1) How can methods of international scientific work contribute to the creation of an international spirit and to the maintenance of peace? and, (2) how can scientific organizations and scientists intensify their activities for maintenance of peace?

Science News Letter 55:103, Feb. 12, '49. "French Pile for Research."

Brief description of the French atomic pile, the first known to be in operation outside the English-speaking countries.

Science News Letter 55:150, March 5, '49. "Peaceful Atomic Control."

Suggests that the United Nations, which has not been able to reach any agreement on international atomic energy controls, might turn to the peaceful, non-military side of the problem.

United Nations World p. 17-20, Feb. '49. "Europe's Gentle Atom." LADISLAS FARAGO.

Reports that Scandinavian scientists plan a union of men and piles of cyclotrons, working to promote the well-being of crops and men.

Have you read these Reviewing Stand transcripts?

Atomic Energy and Peace

Vol. 9, No. 25

What Is Government's Role in Scientific Research?

Vol. 10, No. 9

Are We Losing Our Race for Scientific Superiority?

Vol. 8, No. 22

Available for 10 cents each in coin

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8. Our Housing Problem—Rent Control.
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